

# **Naval Weapons Station Earle**

## **“A Heritage of Service and a Model for the Future”**

### **Introduction**

Naval Weapons Station (NWS) Earle serves as the Nation’s premier East Coast ordnance storage and transportation facility, and currently has almost three hundred munitions magazines, over one hundred miles of rail line, a 2.9 mile pier complex (the largest finger pier complex in the northern hemisphere), and infrastructure valued at \$1.5B. The Installation supports the Atlantic Fleet’s Carrier and Expeditionary Strike Groups and is a hub to four Military Sealift Command cargo/ammunition ships.

In support of our mission, NWS Earle is committed to responsible management of the Installation’s environment as well as, that of the surrounding communities. Good environmental stewardship is essential to the safe, healthful, and compliant execution of our mission, while preserving and protecting our land, air and water. NWS Earle is located in Monmouth County, approximately 20 miles south of New York City. The 12,000 acre installation extends from its Mainside area located in the middle of the County in Colts Neck to the Waterfront area on Sandy Hook Bay in Middletown Township. NWS Earle employs 787 civilians, which comprises approximately 77 percent of all base personnel.

The natural landscape at NWS Earle includes over 2,800 acres of wetlands and 32.5 acres of open water ponds. Various springs and small brooks feed the eleven ponds that make up the area. The Mainside is at the headwaters of three major watersheds; the Manasquan, Shark, and Navesink Rivers and the Waterfront area is within the Sandy Hook Bay watershed. The NWS Earle Pier Complex is located within the nearshore habitat of Sandy Hook Bay. In the vicinity of where the Pier Complex connects to land in the Waterfront Area, the bay shoreline is characterized by marinas and other developed areas within intermittent salt marsh systems at the mouth of various drainages. NWS Earle is also home to five state listed threatened species, eleven state listed endangered species, five state special concern species, three Federally listed threatened species and one Federal candidate species for listing under the Endangered Species Act.

### **Background**

The NWS Earle Integrated Natural Resource Management Plan (INRMP) addresses natural resources for the Installation. The INRMP provides detailed descriptions of the natural resources present, identifies management issues, and establishes specific natural resources management activities. The first compliant INRMP for NWS Earle was dated November 2001 and the current INRMP is dated March 2013. The most recent internal natural resources self-assessment was completed September 2016 for the FY16 Environmental Program Status Summaries located within the Internal Assessment Plan. There are several cooperative agreements that support the INRMP as follows:

- Memorandum of Understanding between Commanding Officer, Naval Weapon Station Earle and New York/New Jersey Baykeeper signed 28 March 2013
- Letter of Acceptability for Atlantic Sturgeon Monitoring from Commanding Officer, Naval Weapon Station Earle to Keith Dunton, Ph.d., Monmouth University signed 8 August 2016

- Monmouth County Mosquito Extermination Commission License for Facility Access dated 20 February 2013; modified 7 May 2014
- Monmouth County Mosquito Commission Contract dated November 2014

The Environmental Office team is a division of NAVFAC MIDLANT, Public Works Department Earle, a tenant command onboard Earle. The team maintains compliance with all local, State and Federal natural resources laws and regulations and manages protected species and habitats through the INRMP. The team consists of nine staff personnel including the Installation Environmental Program Director, Environmental Engineers, Natural Resources Specialists, and Environmental Protection Specialists.

### **Summary of Accomplishments**

NWS Earle is committed to managing its shorelines and increasing resiliency to future flooding events. NWS Earle suffered almost \$50M in damage during Superstorm Sandy, which raised awareness of the increasing risk of extreme weather events and our need to adapt to Climate Change and Sea Level Rise (CC/SLR), a Navy priority. Therefore, NWS Earle embarked on a Holistic Shoreline Management and Resiliency Program referred to as the “Program” throughout the remainder of this award package. Under this Program, we are taking a multi-prong approach and conducting several synergistic shoreline restoration and protection projects which are all accomplished in partnership with Federal, State, and local governments along with universities and non-governmental organizations (NGOs).

By executing the five following projects which make up the Holistic Shoreline Management and Resiliency Program NWS Earle is fulfilling the commitments contained in its INRMP and upholding its mission to support tenant commands which operate throughout the Installation.

#### **Ware Creek Salt Marsh Water Flow and Mosquito Control**

After Superstorm Sandy, a portion of Middletown Township experienced recurrent flooding. NWS Earle and Middletown determined that heavy growth of the Common Reed (*Phragmites australis* or phrag) had filled the drainage ditches leading from the stormwater outfall to Ware Creek to the west of the Installation. The Monmouth County Mosquito Control unit worked with the Navy to reopen over a thousand feet of mosquito ditches, and is now maintaining them to minimize flooding. Success with the cooperative effort started in the 200 acre Ware Creek salt marsh led us to repeat the ditch opening operations to the east of the Installation in the 20 acre Leonardo salt marsh. Both are now being maintained open, increasing stormwater capacity, increasing salinity, and increasing fish passage across the marshes which in turn is a natural biological method of controlling mosquitos.

#### **Marsh Vegetation Restoration and Maintenance**

NWS Earle and its partners are restoring an existing 200 acre salt marsh by removing invasive plant species and replacing them with native plant species. An invasive species management action was recognized as necessary to reduce drainage clogging and to improve habitat within the marshes. In the past twelve months, the County conducted mowing in an effort to weaken the phrag. Approximately 50 acres of marsh will be mowed twice a year in the Ware Creek and Leonardo marshes for the next several years. Additional steps being considered, such as prescribed burning and native species plantings will also be beneficial as the mats of phrag break

up. It is recognized that this is a multiyear process to control the invasive species and return the marsh to a more natural state.

### **Creating a Living Shoreline: Introducing Oyster Reefs**

Working with the NY/NJ Baykeeper and the Rutgers Center for Urban Environmental Sustainability (CUES), NWS Earle is hosting a project to bring viable oyster reefs back to Raritan Bay. Scientific studies hosted at Earle investigated three different reef structures and ultimately identified “oyster castles” as the hard substrate of choice for a larger project. The first set of sixty of these Lego®-like concrete blocks were placed in the permitted 0.25 acre study area, between the NWS Earle piers, to study stability during the 2015-2016 winter storm season. (See the life cycle photos below displaying the success the Navy has had over the past year.) In the summer of 2016, a New Jersey Department of Environmental Protection (NJDEP) living shorelines permit was approved. A 1,000-block reef (totaling 0.91 acres) will be placed in front of Ware Creek beach creating a living shoreline to lower wave energy, improve storm surge resistance and re-establishing viable oyster reef habitats within Raritan Bay and the Hudson Raritan Estuary. The first two tons of oyster castles were placed August 17-18, 2016 with the balance to follow when the water warms in the Spring of 2017.



Four week old spat on shell



Four month old spat on shell



Reef balls with juvenile oysters

### **Coastal Land Preservation**

Monmouth County, working with NWS Earle, has proposed a landscape scale land preservation project covering all of NJ Watershed Management Area (WMA) 12, which includes most of Monmouth County. The project focuses on using land preservation, partially funded by the Department of Defense (DoD), to preserve coastal wetlands for storm surge and upland areas to protect stormwater capacity. Some areas could be used to allow marsh retreat in the event of sea level rise. Land preservation is an integral component of CC/SLR adaptation. The County government passed resolutions authorizing partnership with NWS Earle to preserve land for resiliency and has been approved by the Navy for a \$230K Joint Land Use Study (JLUS) in FY16. The JLUS was awarded to Monmouth County in the Fall of 2016, with Climate Adaptation being a major focus of the project.

### **Green Infrastructure Planning and High Water Mark Initiative**

The High Water Mark Initiative is made possible through a partnership with the Monmouth University Urban Coast Institute, New Jersey Sea Grant Consortium, National Park Service, Jacques Cousteau National Estuarine Research Reserve at Rutgers University, NWS Earle and the NJDEP.

As part of the initiative, communities install signage in designated locations to enhance ongoing educational efforts to build local awareness of flood risk. In addition, participating communities including NWS Earle must take comprehensive measures aimed at strengthening community resilience against future flooding, such as stormwater management projects and building elevation. NWS Earle recently completed a \$24M pier utility replacement project which raised the



water, wastewater and electric utilities 24-36 inches while making them more robust to adapt to CC/SLR. The Department of the Interior spent \$3.6 million on its wave tank test facility located on Earle to protect it from storm surge while one building was moved 1,000 feet inland and 8 feet higher to adapt to CC/SLR. These steps will protect the salt marshes from spills during extreme weather events.

The Monmouth County Freeholders and Sheriff were joined in June 2016 by Middletown Mayor Gerald Scharfenberger, Captain Jay Steingold of NWS Earle, FEMA Region II Administrator Michael Moriarity, and Tony MacDonald Director of the Monmouth University Urban Coast Institute to unveil the sign meant to highlight the flood waters “high water mark” associated with Superstorm Sandy (see photo above).

### **Technical Merit and Environmental Benefits of the Program**

The NWS Earle Holistic Shoreline Management and Resiliency Program provides for a healthy coastal ecosystem while also providing storm resiliency necessary to protect the Navy’s mission. We do this through a series of initiatives that work in harmony to address all aspects of the ecosystem.

The Ware Creek Salt Marsh Water Flow and Mosquito Control portion of the program provides several environmental benefits.

- Since Superstorm Sandy, recurrent flooding in one section of Middletown has been prevented by reopening drainage ditches through the salt marshes, showing the citizens that government is responsive and effective, building trust and allowing lives to be rebuilt.
- By increasing water flow within the salt marshes, the salinity has increased and our habitat has improved. Juvenile baitfish, such as menhaden, can thrive in the marshes, providing food for other fauna higher in the food chain.
- By reducing stagnant water, mosquito populations can be reduced without the use of pesticides. With the looming potential for the spread of mosquito-borne diseases like Zika, the reduction in the mosquito population across a 200-acre marsh provides notable environmental and health benefits.

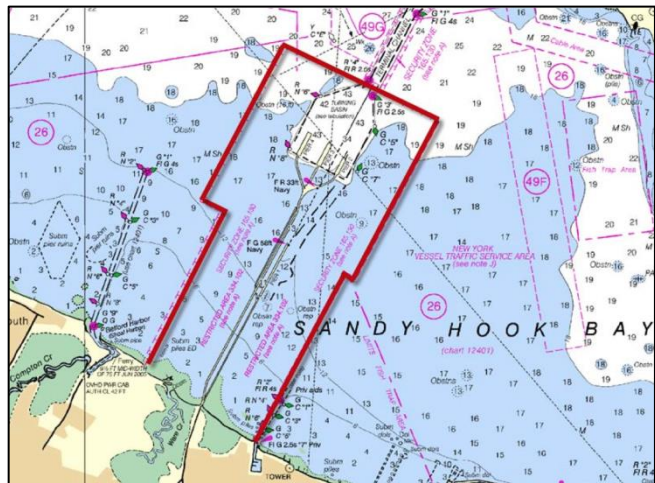


The Marsh Vegetation Restoration and Maintenance portion of the Program, along with the water flow program has also promoted the use of the site by waterfowl. During field surveys conducted by the Navy, many types of waterfowl were observed in the marshes including mergansers, ducks, plovers, herons, and oystercatchers. The Federal candidate and state threatened shorebird, the red knot (has not been confirmed on the Installation since 2008), will now have potential foraging habitat on the mudflats at the Waterfront as a result of the marsh restoration. Two osprey nests successfully fledged on NWS Earle adjacent to Ware Creek this summer and peregrine falcons regularly forage along the piers. The Installation also erected four nesting platforms to further encourage osprey nesting in the vicinity of the restored marsh area to provide osprey with a safe alternative to utility poles with live electric lines.

NWS Earle began its “Creating a Living Shoreline” project in 2015 by establishing new colonies of oyster beds. In October 2012, Superstorm Sandy destroyed the Baykeeper’s oyster hatchery in Highlands, NJ. NWS Earle allowed their oyster setting tanks to be rebuilt on the installation and several hundred thousand spat were set during the test program. The tanks (setting oyster larvae at a production scale to seed the one thousand oyster castles), needed for the first oyster reef, were installed in Summer 2016. After four weeks, the reef was colonized by 15+ species, (crabs, fish, barnacles, etc.) and the oysters showed good survivorship. Even though there were heavy seas during the recent offshore storms, there was little evidence of sedimentation. The oysters grew from 3mm to 17mm on average. This project placed the first true reef in the estuary in over one hundred years, improving water quality, providing fish habitat and protecting the shoreline.



Lowering of Oyster Castles on the NWS Earle Pier Complex, Summer 2016



Security Zone around the NWS Earle Pier Complex  
Denoted in Red

NWS Earle is unique in that the Navy security zone promotes coastal land preservation everyday by protecting shorebirds, diamondback terrapins, and horseshoe crabs from disturbance by man. The intersection of national security requirements and tidal wetlands allows habitat restoration along an otherwise heavily developed shoreline. Furthermore, the JLUS will ensure preservation, protection and post-storm resiliency within WMA 12 while protecting safety of the surrounding communities through increased adaptation to adverse impacts from SLR.

## **Stakeholder Interaction**

The five projects briefly described under “Summary of Accomplishments” have developed into a holistic Program with multiple stakeholders and funding sources addressing immediate environmental needs (increasing stormwater capacity to eliminate residential flooding) and the long term challenges posed by CC/SLR. The program shows an individual military installation implementing the DoD’s Climate Change Adaptation Roadmap, identifying local risks and adapting to those risks.

The Program integrates County, municipal and non-governmental organization (NGO) stakeholders with the Installation’s local workforce and support from Navy Region Mid-Atlantic in Norfolk, Virginia. Integrating multiple stakeholders required outside the box thinking and the willingness of the political leadership to focus on protecting the community. It is government at its best, adapting to local conditions, taking advantage of opportunities as they arise, following through on commitments, and ignoring turf issues or lack of precedent.

## **Transferability of the Program**

Several elements of the Holistic Shoreline Management and Resiliency Program are broadly applicable in New Jersey.

- Since Superstorm Sandy, recurrent flooding in one section of Middletown has been prevented by reopening drainage ditches through the salt marshes, showing the citizens that government is responsive and effective, building trust and allowing lives to be rebuilt.
- By increasing water flow within the salt marshes, the salinity increased and the habitat improved. Juvenile fish can thrive, providing food for other fauna higher in the food chain as well as serving as a biological means of mosquito control.
- Using green infrastructure tactics to supplement the traditional flood response (i.e., raising the pier utilities and moving buildings) allows the base to benefit from large buffers to either side of the pier complex, rather than protecting the entire complex by building several miles of levees and large capacity pump houses.
- The living shoreline oyster reef work has shown that the Navy can cooperate with an NGO to break through an impasse and allow useful research to occur. Rutgers CUES scientists are showing how oyster reefs can be used as one more piece of the climate adaptation puzzle.

The Holistic Shoreline Management and Resiliency Program can be used as an example in many areas along the NJ shoreline to help other communities use their tidal wetlands as a buffer and valuable resource in long term sustainability. The DoD Climate Adaptation Roadmap calls for every military installation to look at the challenges of a changing climate over a long timeline. Because the Navy’s infrastructure is designed to last almost seventy years, it must be built not just for today’s conditions but for what the world will look like to our children’s children. By working with NGOs as well as local and state governments, informed by the best available scientific data, NWS Earle can act as a catalyst for action across a broad area. This is both her duty to the nation and the most useful, impactful result of the program.

## **Orientation to Mission**

Rather than only being concerned with the small portion of the adjoining salt marshes owned by the Navy (less than 20% of the total area), the military is working with the municipal and County governments to adapt to CC/SLR. This is the first time that these three levels of government worked cooperatively on an environmental issue, with impacts on land owned by all three parties, impacting the surrounding communities, and inspiring this holistic program.

Cooperation between the County Mosquito Control workers and the military has not occurred before on such a large scale. The main County mission, to control mosquitos, however, is perfectly compatible with the interest of the military in preventing flooding and the larger environmental goal of improving tidal wetlands habitat. County and Navy officials are working to increase the scope of cooperation to protect both the strategic military mission and critical community infrastructure through shared services. NJ Bill A2514, pending State Senate approval, further encourages support agreements, synergizing impacts and benefiting all parties.

The Program reflects the Installation's interest in emphasizing green infrastructure techniques to adapt to CC/SLR. The planned living shoreline oyster reef will be parallel to the beach and cover approximately one acre. It will be just subtidal and will reduce the wave energy hitting the shoreline. It is hoped that this will also reduce the risk of V-zone damage along the shore and provide greater protection to the residential communities surrounding the salt marsh. This will be the first use of oyster reefs as a living shoreline to reduce storm surge damage in Raritan Bay or in New York harbor. Lessons learned will provide future project teams with information that can increase effectiveness and efficiency elsewhere in the estuary and along the Jersey Coast.

## **Education and Outreach**

The work occurring for this Program is within our secure military area. To overcome this limitation, public presentations have been given by the Installation regarding this work to the Monmouth County Parks System and Monmouth County Planning Board. Our public partners have also begun to actively report on the results of work occurring in Ware Creek.

Reporters are invited to the base for major milestones. The Asbury Park Press and Two River Times covered the placement of the oyster reef. WCBS-TV shared the oyster reef story with the Metropolitan New York audience, including interviews with the Baykeeper and Navy personnel. The Navy's commitment to climate adaptation shows that communities may positively impact their resiliency but only through sustained action over a long, multigenerational timeframe.

In 2016, NWS Earle staff established a working relationship with the NJ Sea Grant Consortium, located at Sandy Hook, to tell the Navy's story on climate adaptation. The Education staff of the Consortium is developing STEM focused lesson plans and programming activities, which will connect local schools with the Installation through community outreach and provide educational opportunities for our Youth Programs. NWS Earle staff also worked with the NY/NJ Baykeeper Oyster Restoration Program Director on a pilot program for our on-station Youth Programs to have an oyster garden with supporting lesson plans and activities. Piloting educational programs to the youth on the Installation enables more effective rollout to the local school districts. By creating lesson plans that can be used in any classroom across New Jersey, NWS Earle broadly shares its commitment to stewardship of the natural resources entrusted to us.